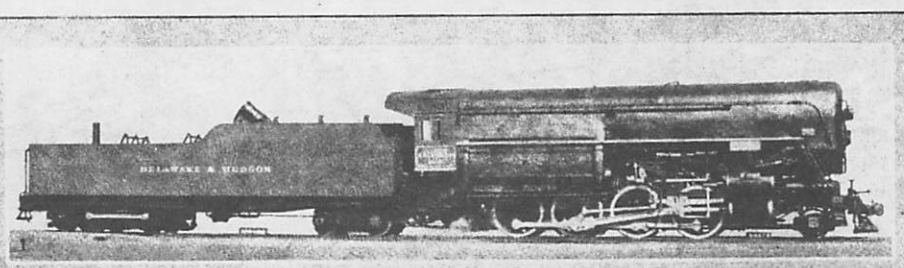
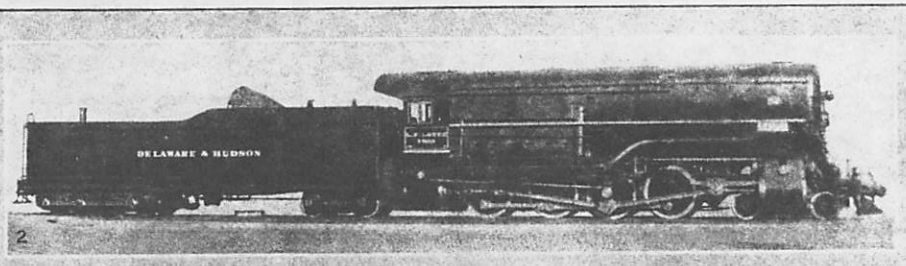
LOCOMOTIVES

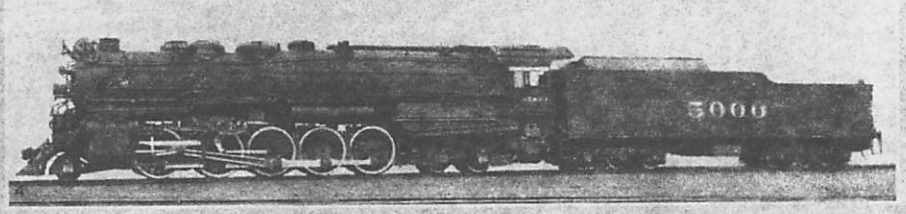


1

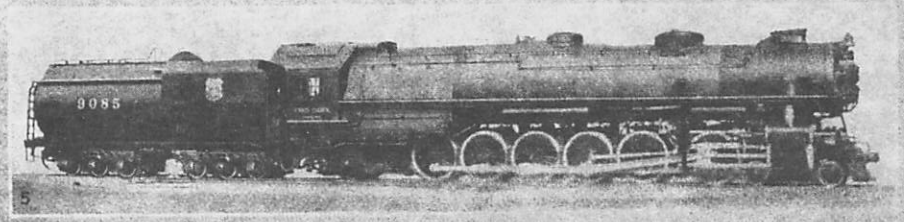


2

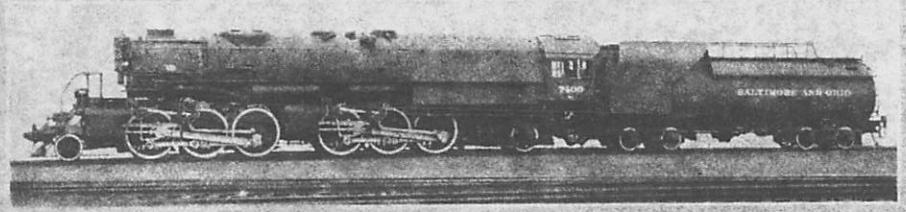
3



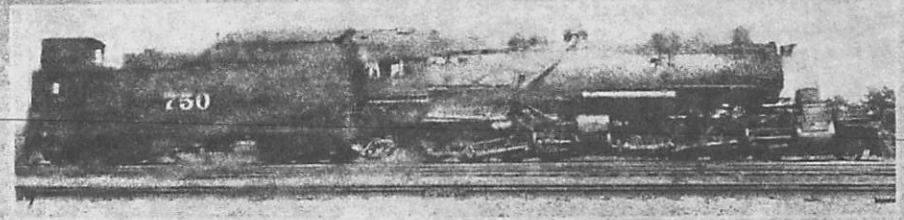
4



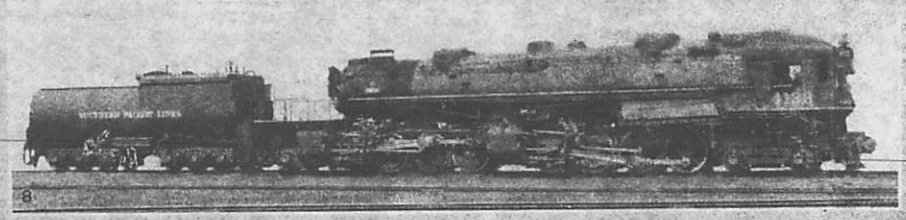
5



6



7

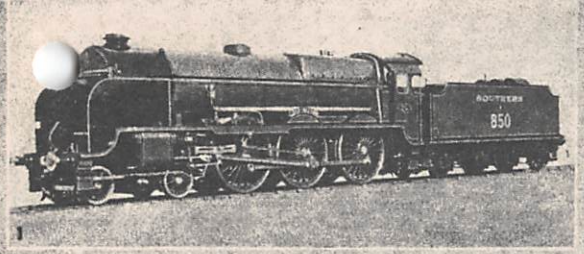


8

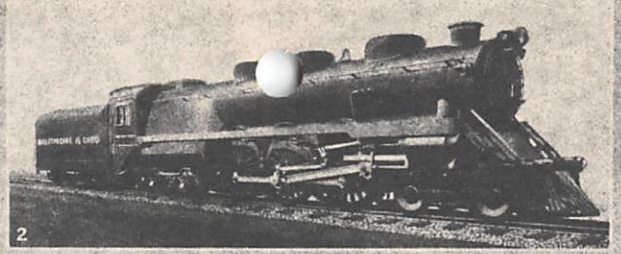
BY COURTESY OF (1, 2) THE DELAWARE AND HUDSON RAILROAD CORPORATION, (3) THE LEHIGH VALLEY RAILROAD, (4) THE ATCHISON, TOPEKA & SANTA FE RAILWAY, (5) THE UNION PACIFIC, (6) THE BALTIMORE & OHIO RAILROAD, (7) THE KANSAS CITY SOUTHERN RAILWAY COMPANY, (8) THE SOUTHERN PACIFIC LINES

AMERICAN STEAM LOCOMOTIVES—HEAVY FREIGHT TYPES

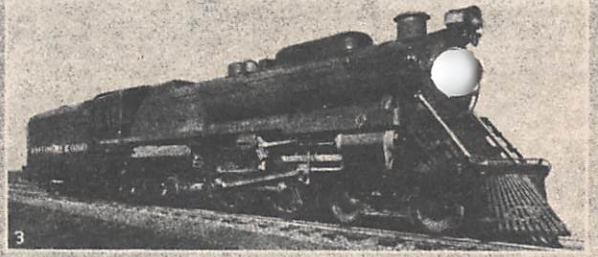
1. Consolidation, 2-8-0 type. Fast heavy freight service: fuel, anthracite and bituminous coal mixed; tractive effort, simple 84,300 lbs.; compound 70,300 lbs.; additional for tender truck booster 18,000 lbs.; boiler pressure 500 lbs.; cylinders, 2 multiple expansion, 1 high-pressure, 1 low-pressure; drivers 63"; weight on drivers 300,000 lbs.; total weight engine ex. tender 356,000 lbs.
2. Twelve-wheel 4-8-0 type. Fast heavy freight service; fuel, anthracite and bituminous coal mixed; tractive effort, simple 90,000 lbs.; triple expansion 75,000 lbs.; additional for tender truck booster 18,000 lbs.; boiler pressure 500 lbs.; cylinders, 4 triple expansion, 1 high-pressure, 1 intermediate pressure, 2 low-pressure; poppet valves and outside cam valve gear; drivers 63"; weight on drivers 313,000 lbs.; total weight engine ex. tender 382,000 lbs.
3. Sixteen-wheel 4-8-4 type. Passenger and fast freight service; fuel, bituminous coal; tractive effort 66,500 lbs.; boiler pressure 275 lbs.; cylinders, 2 single expansion; drivers 77"; weight on drivers 272,200 lbs.; total weight engine ex. tender 435,000 lbs.
4. Twenty-wheel 4-10-4 type. Fast freight service; fuel, bituminous coal; tractive effort 80,000 lbs.; boiler pressure 300 lbs.; cylinders, 2 single expansion; drivers 73"; weight on drivers 349,910 lbs.; total weight engine ex. tender 502,260 lbs.
5. Eighteen-wheel 4-12-2 type. Freight service; fuel, bituminous coal; tractive effort 96,650 lbs.; boiler pressure 220 lbs.; cylinders, 3 single expansion; drivers 67"; weight on drivers 372,000 lbs.; total weight engine ex. tender 515,000 lbs.
6. Sixteen-wheel Mallet 2-6-6-2 type. Freight service; fuel, bituminous coal; tractive effort 90,000 lbs.; boiler pressure 250 lbs.; cylinders, 4 single expansion; drivers 70"; weight on drivers 372,000 lbs.; total weight engine ex. tender 465,000 lbs.
7. Eighteen-Wheel Mallet 2-8-8-0 type. Heavy freight service; fuel, powdered bituminous coal and lignite, and fuel oil; tractive effort, simple 147,220 lbs., compound 122,683 lbs.; boiler pressure 250 lbs.; firebox type superheater; cylinders, multiple expansion, 2 high-pressure 2 low-pressure; drivers 57"; weight on drivers 466,000 lbs.; total weight engine ex tender 495,000 lbs.
8. Twenty-two wheel 4-8-8-2 type. Passenger and freight service, fuel, fuel oil; tractive effort



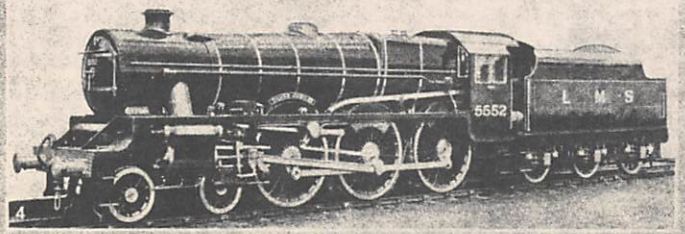
1



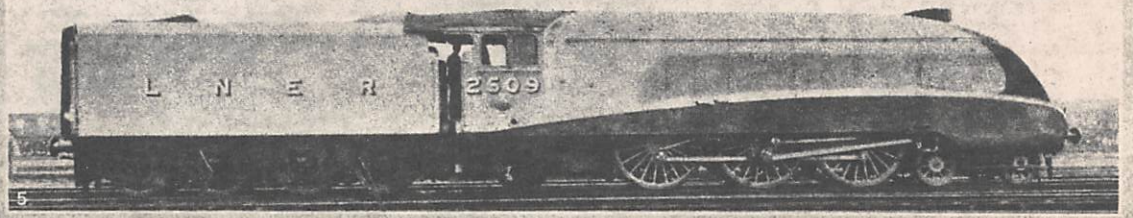
2



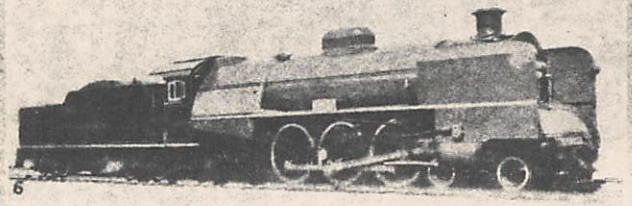
3



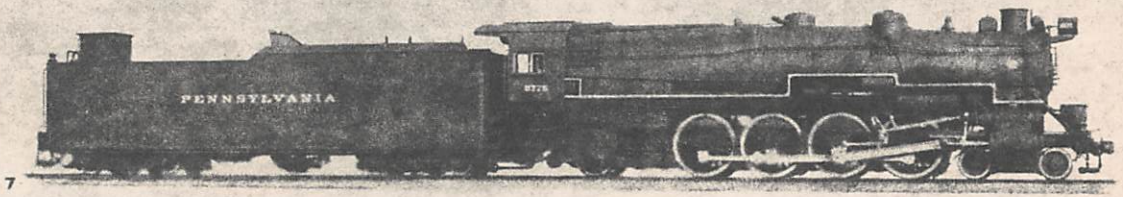
4



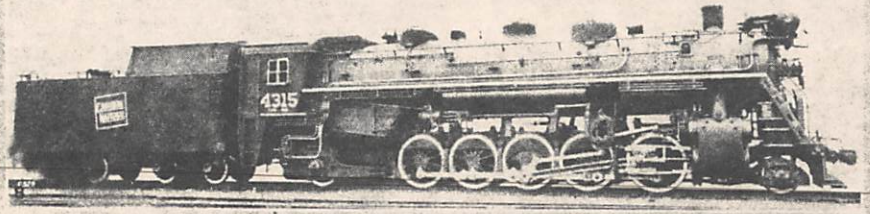
5



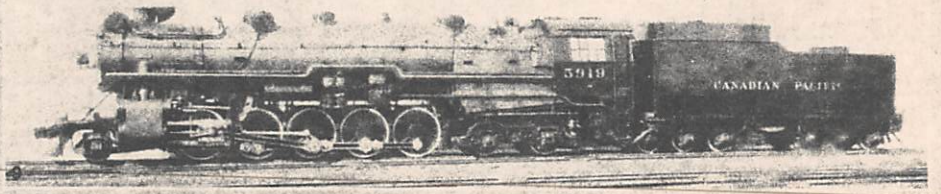
6



7



8



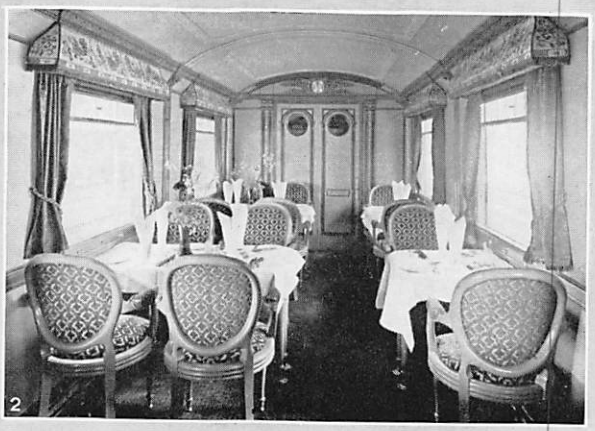
9

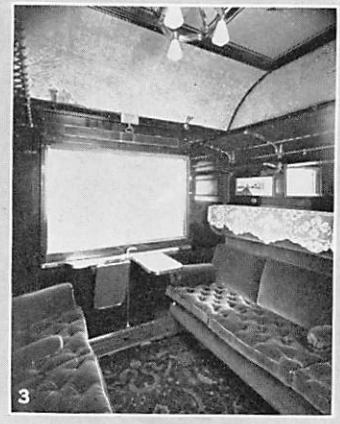
BY COURTESY OF (1) THE SOUTHERN RAILWAY, (2, 3) BALTIMORE & OHIO RAILROAD COMPANY, (4) THE LONDON, MIDLAND AND SCOTTISH RAILWAY, (5) THE LONDON AND NORTH-EASTERN RAILWAY, (6) THE DELAWARE & HUDSON RAILROAD CORPORATION, (7) THE PENNSYLVANIA RAILROAD, (8) THE CANADIAN NATIONAL RAILWAYS, (9) THE CANADIAN PACIFIC RAILWAY COMPANY

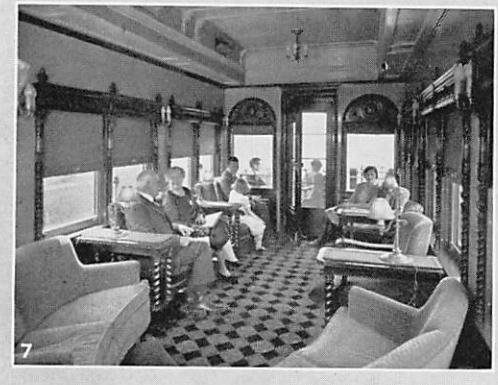
BRITISH AND AMERICAN TYPES OF STEAM LOCOMOTIVES FOR PASSENGER AND FREIGHT SERVICE

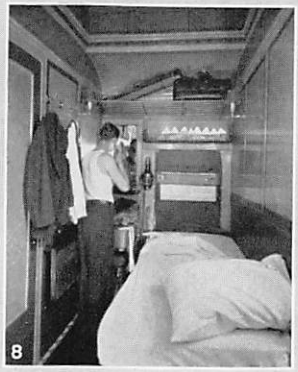
1. Lord Nelson 4-6-0 type. Four-cylinder express passenger locomotive; total weight of engine and tender in working order 140 tons, 4 cwt.; tractive effort at 85 per cent boiler pressure 33,500 lbs. 2. Lord Baltimore, Pacific 4-6-4 type. Fast passenger service; fuel, soft coal; tractive effort 34,000 lbs.; boiler pressure, 350 lbs.; cylinders 19 in. diameter, 28 in. stroke; drivers 84"; weight on drivers 156,000 lbs.; total weight engine ex. tender 294,000 lbs. 3. Lady Baltimore, Atlantic 4-4-4 type. Fast passenger service; fuel, soft coal; tractive effort 28,000 lbs; boiler pressure, 350 lbs.; cylinder 17½ in. diameter, 28 in. stroke: drivers 84"; weight on drivers 99,800 lbs.; total weight engine ex. tender 217,800 lbs. 4. Silver Jubilee 4-6-0 type. Fuel, bituminous coal; boiler working pressure 225 lbs. per sq. in.; three cylinders 17" dia. x 26" stroke; tractive effort at 85% B.P. 26,610 lbs.; weight ex. tender (light) 168,784 lbs. 5. Silver Link 4-6-2 three-cylinder engine, type A.4. Fuel, coal; boiler pressure 250 lbs.; cylinders, 18½ in. diam., 26 in. stroke; driving wheel 6 ft. 8 in.; tractive power at 85% boiler pressure 35,455 lbs.; weight of engine and tender 165 tons 7 cwt. 6. Pacific 4-6-2 type. Fast passenger service; fuel, anthracite and bituminous coal mixed; tractive effort 59,500 lbs.; boiler pressure 325 lbs.; cylinders, 2 single expansion; poppet valves and outside rotary cam valve gear; drivers 73"; weight on drivers 191,000 lbs.; total weight of engine ex. tender 296,500 lbs. 7. Fourteen-wheel 4-8-2 type. Fast freight and passenger service; fuel, bituminous coal; tractive effort 64,550 lbs.; boiler pressure 250 lbs.; cylinders, 2 single expansion; drivers 72"; weight on drivers, 271,000 lbs.; total weight engine ex. tender 390,000 lbs. 8. Fourteen-wheel 2-10-2 type. Heavy freight service; fuel, bituminous coal; tractive effort 61,600 lbs.; boiler pressure 275 lbs.; cylinders, 2 single expansion; drivers 57"; weight on drivers 261,040 lbs.; total weight engine ex. tender, 344,170 lbs. 9. Sixteen-wheel, 2-10-4 type. Heavy freight service; fuel, bituminous coal; tractive effort 77,200 lbs.; boiler pressure 275 lbs.; cylinders, 2 single expansion; drivers 63"; weight on drivers 312,800 lbs.; total weight engine ex. tender 452,000 lbs.

RAILWAYS





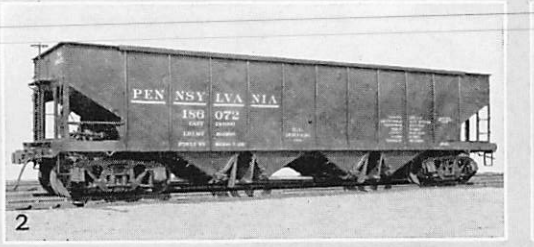


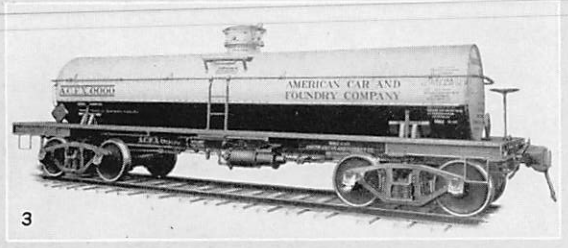


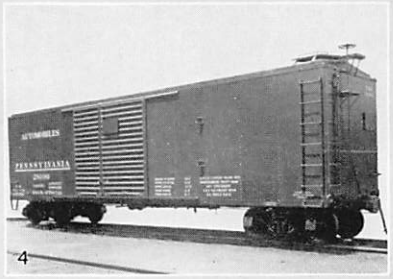
BY COURTESY OF (1, 3, 5) THE GERMAN TOURIST INFORMATION BUREAU, (2) LONDON AND NORTH EASTERN RAILWAY, (4) THE INTERNATIONAL WAGON-LITS COMPANY, (6, 10, 11, 12) THE UNION PACIFIC RAILROAD, (7, 8, 9) THE PULLMAN COMPANY

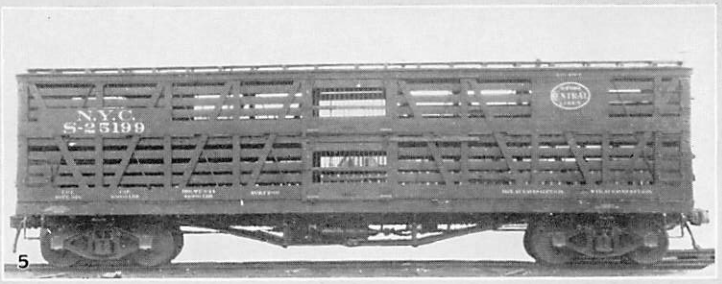
RAILROAD PASSENGER ACCOMMODATIONS

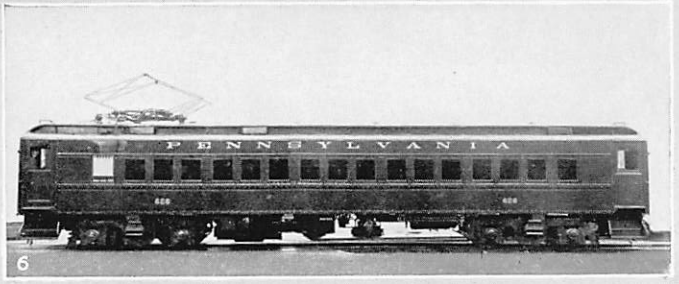
1. Corridor of a German express train, showing private compartments
2. Interior of a first-class dining car, London and North Eastern Railway
3. A first-class compartment on a German express train
4. A salon on an International Wagon-Lits Company train, France
5. A private compartment on a German express
6. Cozy comfort in a streamlined American Pullman
7. Observation end of lounge in an American Pullman train
8. Stateroom on Pullman overnight car, showing fixed bed, and individual toilet facilities
9. Standard Pullman sleeping car with semi-private compartments
10. Sleeping compartment on streamlined train
11. The dining section on a streamlined train
12. Novel buffet for meal service

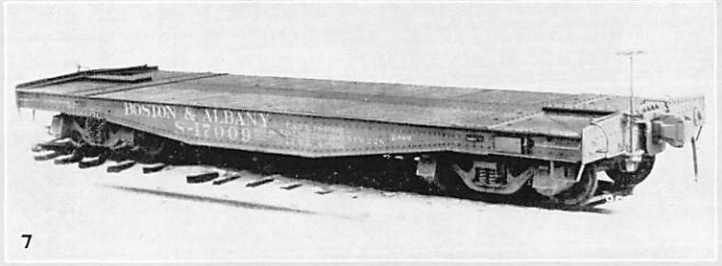


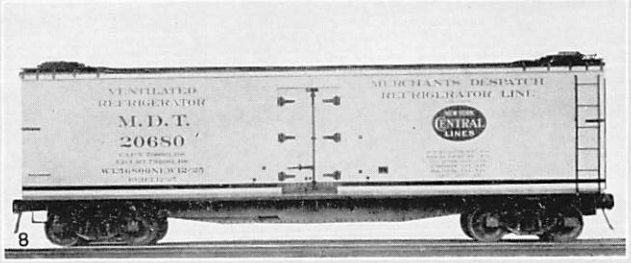


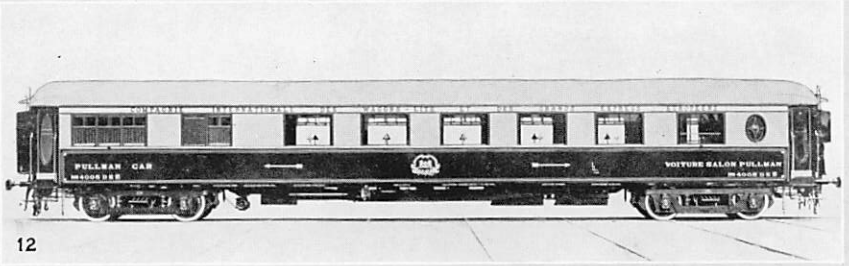








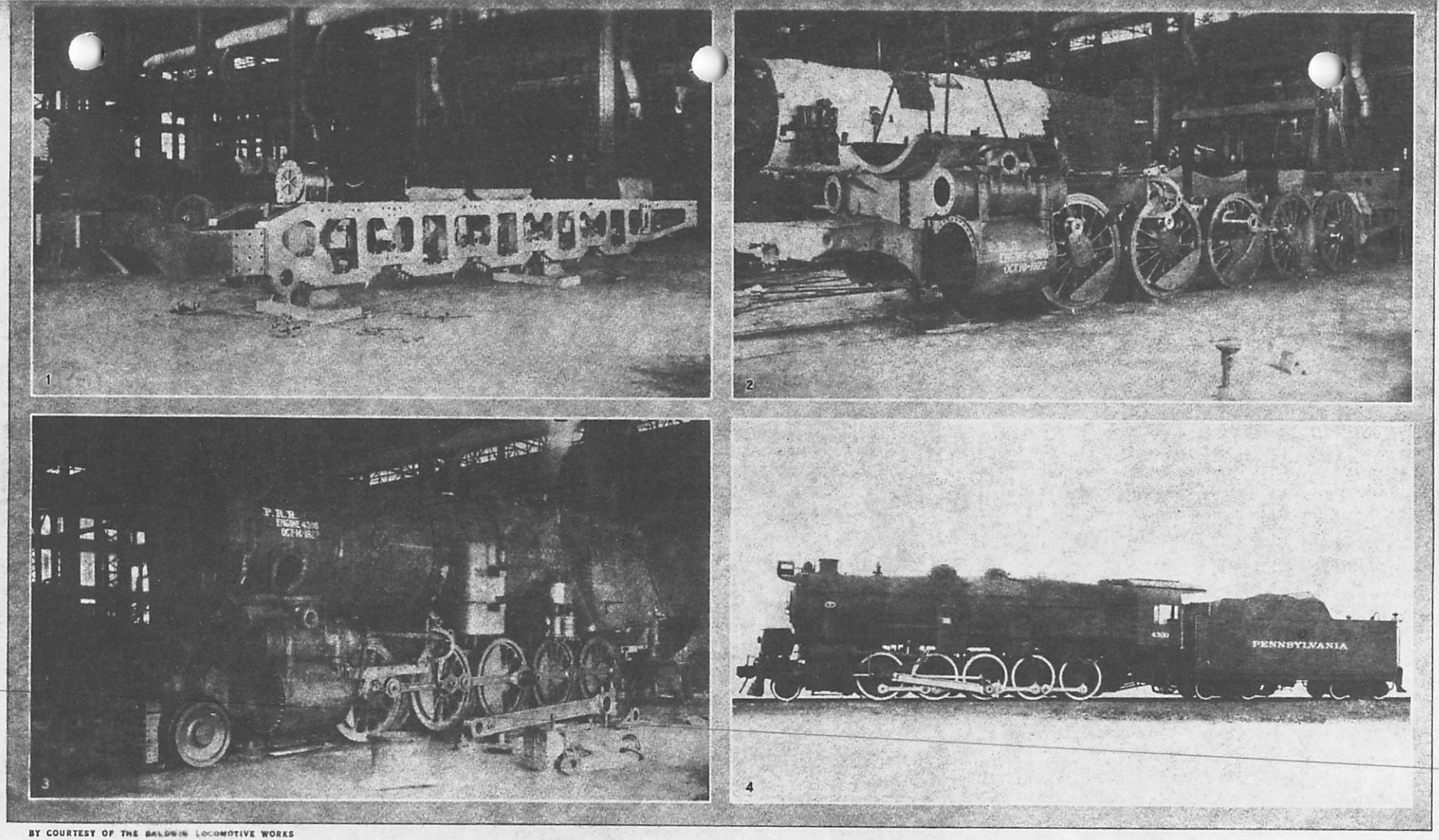




BY COURTESY OF (1) THE VIRGINIAN RAILWAY AND PRESSED STEEL CAR COMPANY, (2, 4, 6, 10) THE PENNSYLVANIA RAILROAD COMPANY, (3) THE AMERICAN CAR AND FOUNDRY COMPANY, (5, 7, 8) THE NEW YORK CENTRAL LINES, (9) THE CHICAGO, MILWAUKEE, ST. PAUL AND PACIFIC RAILROAD COMPANY, (11) THE TIMKEN ROLLER BEARING COMPANY, (12) THE INTERNATIONAL WAGON-LITS COMPANY

VARIOUS TYPES OF ROLLING STOCK

1. All steel, 120 ton, solid bottom gondola exemplifying modern construction. 2. Hopper coal car, 140,000 pounds capacity. 3. Railway tank car for transporting liquid chlorine. Safety release valves provide against excess pressure. 4. Double-sheathed steel, 50-ton, automobile box car. 5. Double-deck, 40-ton, live stock car. 6. Multiple unit electric car, all-steel construction. 7. Special flat car. 8. Ventilated 35-ton, refrigerator car, used extensively for protecting commodities, such as meat, milk, fru[it] and [veg]etables against changes of temperature. 9. The "Pioneer Limited" of the Chicago, Milwauke[e] St. Paul and Pacific Railroad, the first completely roller bearing equipped Pullman train in the history of American railroads. 10. Pennsylvania Railroad's streamlined coal-burning steam locomotive hauling passenger train. 11. One of the first container cars in America, enabling the transference of portable containers directly from motor truck to car, conveniently and without loss of time. 12. Modernly equipped French Pullman train, of the International Wagon-Lits Company

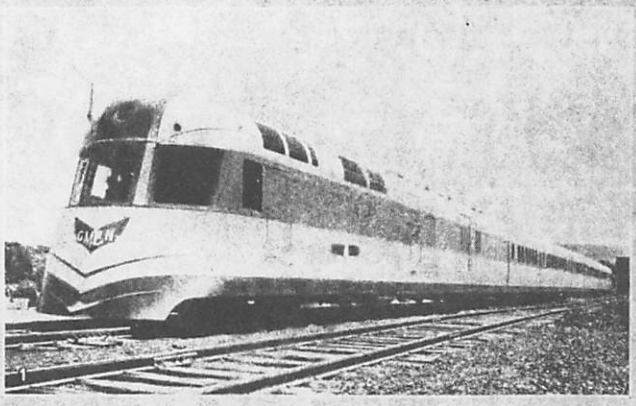


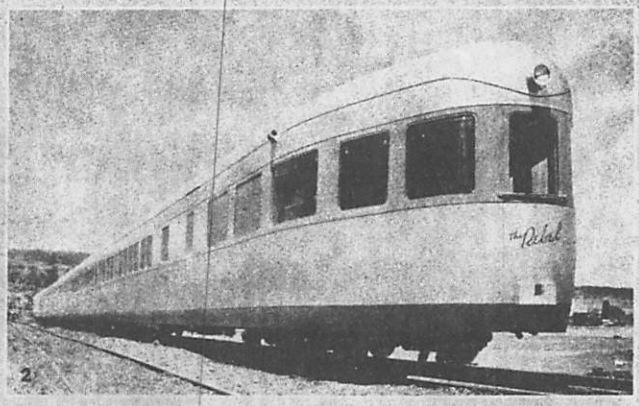
BY COURTESY OF THE BALDWIN LOCOMOTIVE WORKS

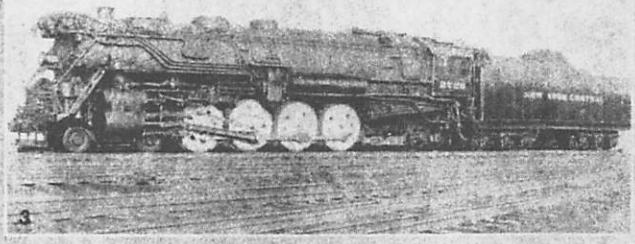
ERECTING A PENNSYLVANIA DECAPOD (TEN-DRIVING-WHEEL) TYPE LOCOMOTIVE

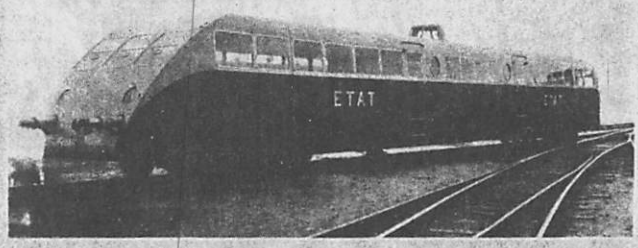
1. Frames and crossties assembled and mounted on the erecting forms.
2. View showing the five pairs of driving wheels assembled to the frame, and the cylinders being lowered into position by means of the crane
3. The boiler in place, preparatory to the application of heat-insulating asbestos lagging. The valve motion mechanisms and side rods are being affixed to the wheels and cylinder
4. The completed locomotive, showing sheet steel outer jacket, and all appurtenances applied

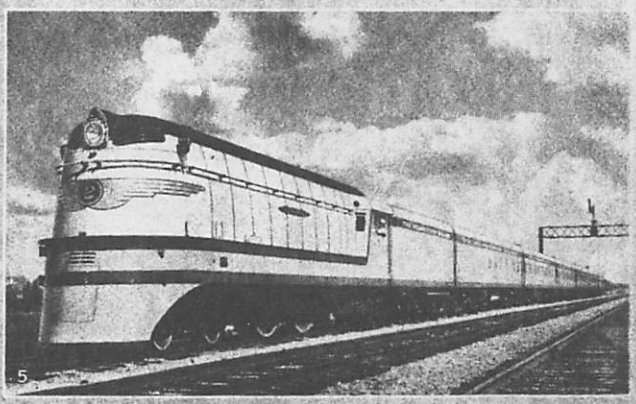
LOCOMOTIVE

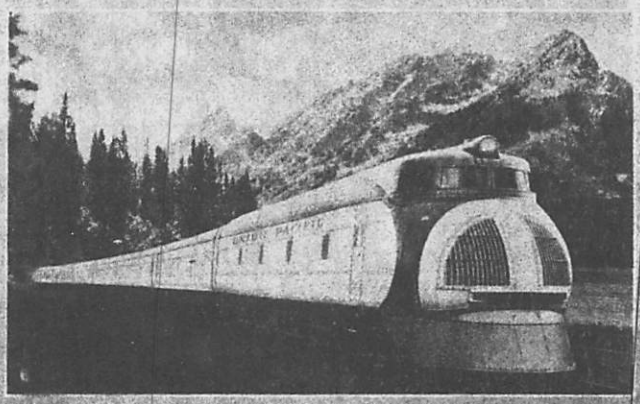


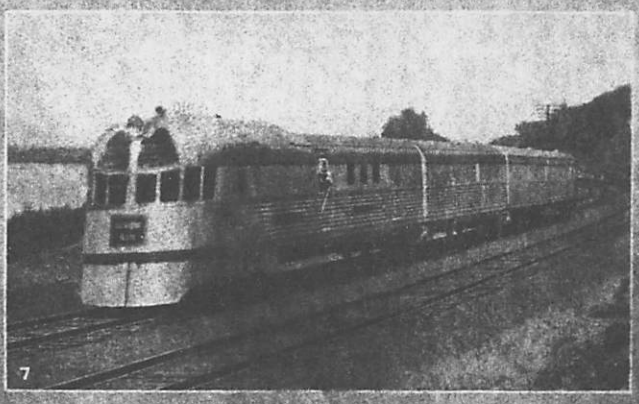








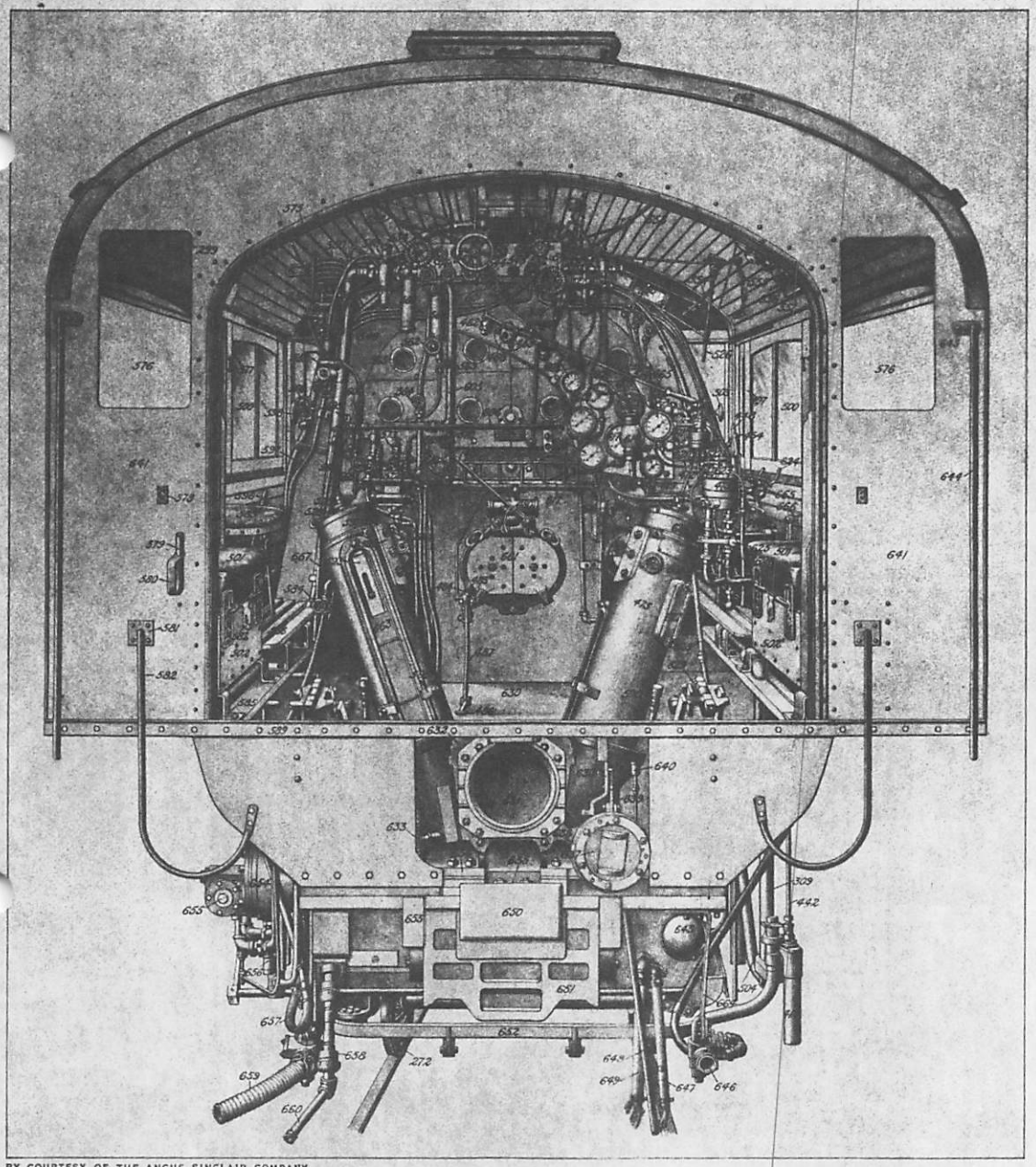




BY COURTESY OF (1), (2) THE AMERICAN CAR AND FOUNDRY CO., (3) THE NEW YORK CENTRAL LINES, (4) THE RAILWAYS OF FRANCE, (5) THE MILWAUKEE ROAD, (6) THE UNION PACIFIC, (7) THE CHICAGO, BURLINGTON & QUINCY R. R., (8) NEW YORK CENTRAL LINES

MODERN LOCOMOTIVES AND TRAINS

1. "The Rebel," streamlined train designed and built by American Car and Foundry Co. for Gulf, Mobile and Northern Railroad. 2. Rear view showing observation end of "The Rebel," first streamlined train for the South. 3. Freight locomotive with new type disc driving wheels. 4. Streamlined unit of the "Bugatti" type, operated on the French State Railways. 5. "The Hiawatha" in service between Chicago, Milwaukee, St. Paul and Minneapolis. 6. "The City of Portland," Union Pacific streamliner. 7. First streamlined "Zephyr" of the Chicago, Burlington & Quincy. 8. "The Twentieth Century Limited," drawn by a Hudson type steam locomotive with 4700 horse power, in operation between New York city and Chicago

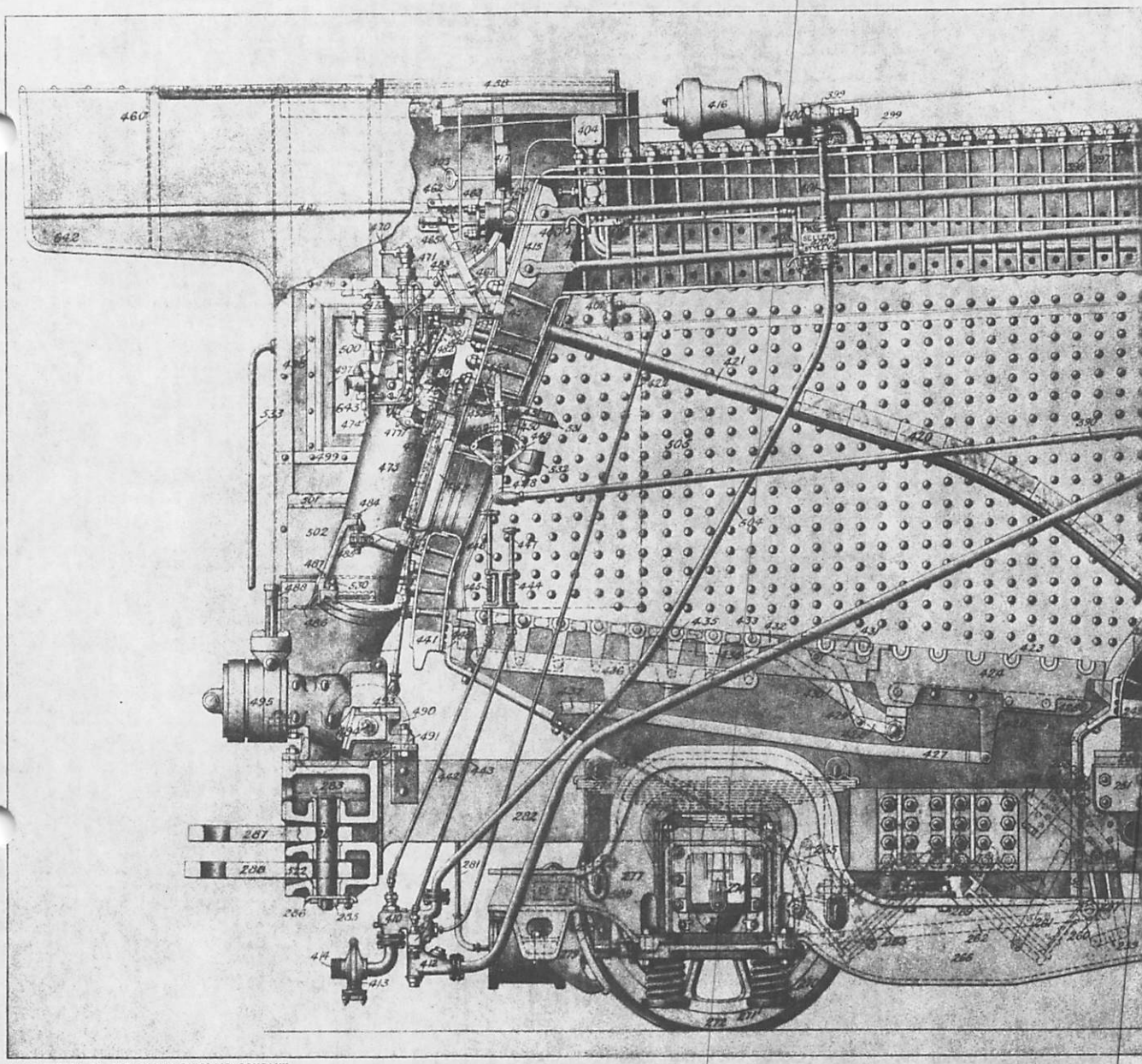


BY COURTESY OF THE ANGUS SINCLAIR COMPANY

PACIFIC OR 4–6–2 TYPE LOCOMOTIVE—FORWARD VIEW

2. Trailing truck details. 299. Bell lever and bell cord. 309. Delivery pipe. 412. Sellers U.S. standard non-lifting injector line check. 417. Steam gauge. 2. Sellers U.S. standard non-lifting injector details. 448–449 Ragonnet power reverse gear details. 454. Ragonnet power reverse gear details. 458. Cab ntilator. 461. Cab eaves trough. 463. Throttle stem stuffing box gland. 465. Throttle lever. 471. Westinghouse independent brake valve body. 472. stinghouse engineer's valve handle. 473. Westinghouse engineer's valve top case. 475. Duplex stoker elevator casing. 481. Franklin fire door opener hand er. 484. Franklin fire door opener hanger bolt. 485. Franklin fire door opener tread hanger adjusting gear. 486–487. Franklin fire door opener tread hanger. 497. Cab window, sash, frame and guides. 500. Cab window, sash, frame and guides. 501–502. Cab seat and box. 503. Sand rod handle. 504. am pipe to injector. 505. Side sheet of fire box. 526. Whistle lever rod. 534. Left injector steam valve handle. 535. Flange lubricator steam valve ndle. 536. Car heating valve handle. 537. Main fountain valve handle. 538. Coal pusher valve handle at turret. 539. Ragonnet reverse gear valve handle. 0. Right injector steam valve handle. 541. Main steam valve handle from turret to stoker. 542. Air pump steam valve handle. 543. Head-light turbine am valve handle. 544. Main lubricator steam valve handle. 545. Cab heater turret steam valve handle. 546. Grate shaker steam valve handle. 547. Main wer valve handle. 548. Reducing valve for steam heat. 549. Car heat steam pipe. 550. Steam coil for flange lubricator. 551. Sight feed flange lubricator. 2. Sight feed stoker lubricator. 553. Cab brace. 554–555. Whistle rod and cord. 556–557. Pyle National head-light switch and dimmer. 558. Gauge k. 559. Lubricator light. 560. Water glass lamp. 561. Water glass. 562–563. Water glass shut off valve and drip pipe valve. 564. Main steam pipe valve grate shaker. 565. Washout plug for crown sheet. 566. Left blower valve. 567. Cab heater valve. 568. Stoker valve. 569. Coal pusher valve. 570–571. l pusher pipe valve and pusher valve. 572. Grate shaker handles. 573. Grate shaker oil cup. 574. Water gauge funnel. 575. Cab opening stiffening angle. 5. Back cab window opening. 577–578. Cab window hook and gangway chain hook. 579. Bar for cab handhold. 580–582. Cab handhold and grabiron. 3. Cab drop seat. 584. Sprinkling hose valve. 585–586. Seat-step and foot-rest. 587. Seat box hasp. 588. Grate shaker lever. 589. Bottom cab stiffening gle. 590. Oil pipe to duplex stoker driving rack. 591–595. Duplex mechanical stoker details. 596. Blow-off cock lever. 597. Blower pipe. 598. Injector rting valve lever. 599–600. Duplex stoker operating rod bearing and handles. 601. Lubricator pipe to steam cylinder. 602. Lubricator pipe to steam linder of air pump. 603. Steam valve Pyle National head-light turbine. 604. Steam valve for Ragonnet reverse gear. 605. Coal pusher steam pipe. 606. plex stoker operating rod. 607. Steam gauge Pyle National head-light turbine. 608. Steam gauge for flange lubricator. 609. Pyrometer gauge. 610–611. ge and small duplex air gauges. 612–613. Car and cab heater gauges. 614. Steam gauge lamp. 615. Oil can rack. 616. Duplex stoker conveyor oil cup. 7. Oil can shelf. 618. Train line gauge pipe. 619. Brake cylinder gauge pipe. 620. Release valve for brakes. 621. Brake application pipe. 622. Distrib- ng valve release pipe. 623. Main reservoir pipe. 624. Sander valve handle. 624a. Train line pipe cut-out cock handle. 625. Train line pipe cut-out cock. 5. Equalizing reservoir pipe. 627. Duplex stoker elevator casing door. 628. Drain pipe for gauge cock funnel. 629. Grate shaker. 630. Footplate. 631–640. plex mechanical stoker details. 641–642. Cab wall and hood. 643. Double-heading cock. 643a. Equalizing reservoir. 644. Cab handhold. 645. Cab hand- d crowfoot. 646. Feed water suction pipe valve. 647. Air signal hose. 648. Gauge cock drip pipe. 649. Air brake hose. 650. Back buffer plate. 651. lt safety bar casting. 652. End piece of trailing truck. 653. Engine frame. 654–655. Duplex stoker cylinder and steam chest. 656. Left injector. 657. w-off pipe. 658. McLaughlin flexible conduit. 659. Suction hose. 660. Steam-heater pipe. 661. Franklin fire door. 662. Duplex stoker peep hole. 663. plex stoker elevator casing slide guide. 664. Feed water suction pipe valve bracket. 665. Sander valve. 666. Driver brake cylinder cut-out cock. 667. Du- x stoker reach rod

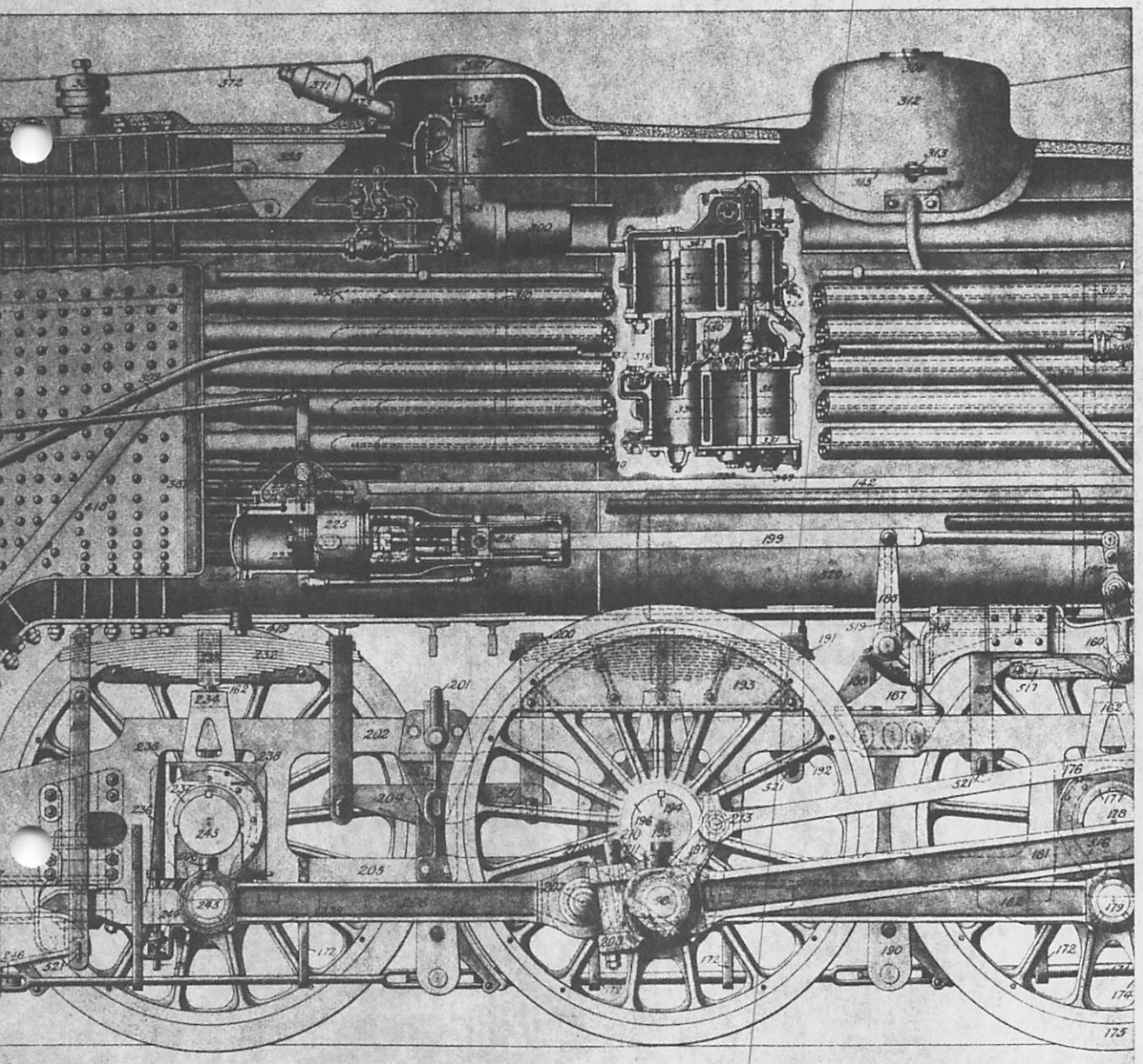
LOCOMOTIVE



BY COURTESY OF THE ANGUS SINCLAIR COMPANY

PACIFIC OR 4–6–2 TYPE LOCOMOTIVE—CAB AND FIREBOX DETAILS

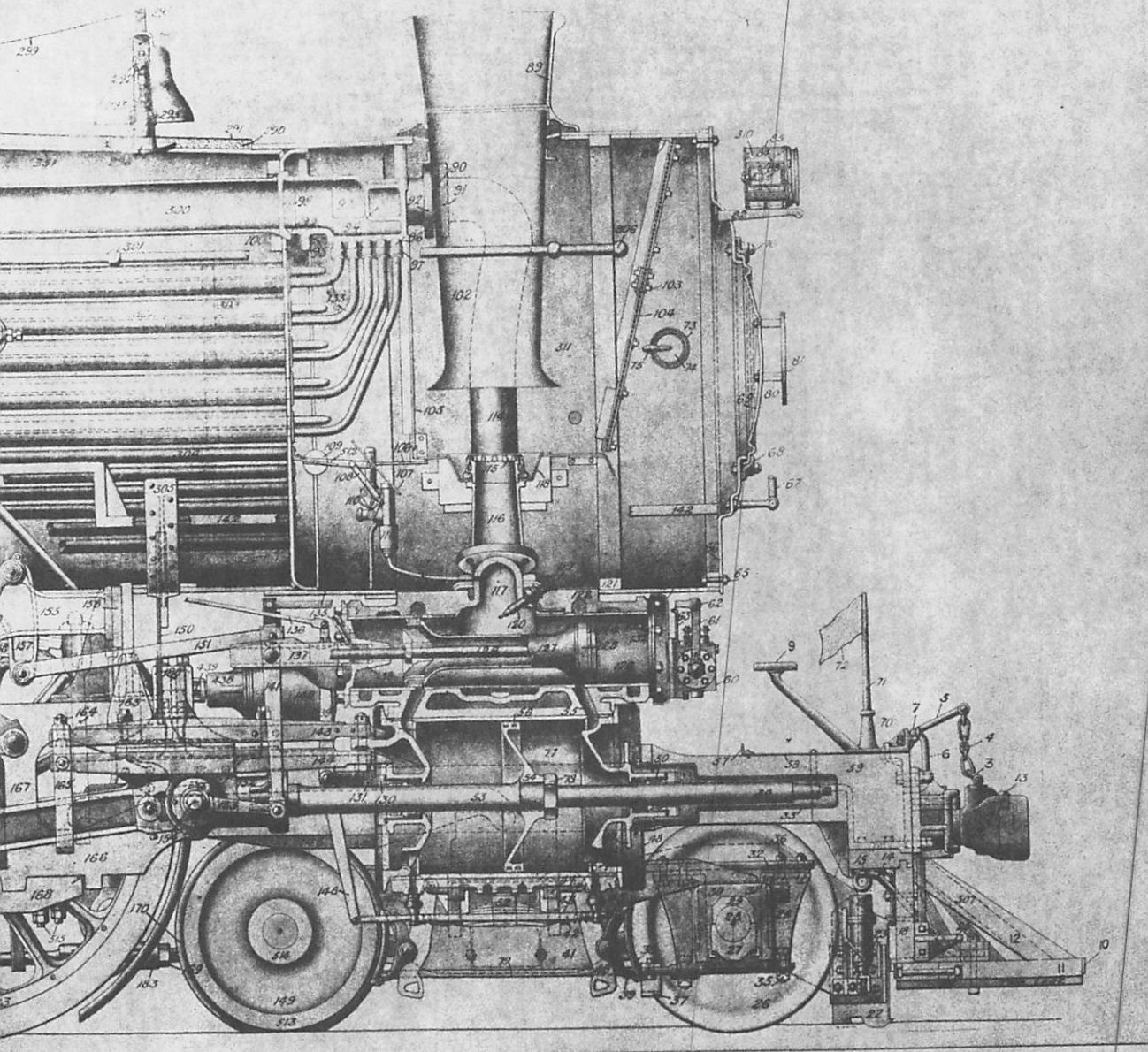
248. Driver brake lever. 249–250. Foundation ring bearing shoe and support. 251. Expansion plate. 252. Ashpan casing. 253. Operating lever for ashpan doo of front hopper. 254. Operating lever for ashpan door of rear hopper. 255. Lifting bar front hopper ashpan door. 256. Swinging lever front hopper ashpan doo 257. Bell crank arm for rear hopper ashpan door. 258. Bell crank arm for front hopper ashpan door. 259. Connecting link front ashpan hopper door rigging. 26 Lower arm swinging lever ashpan hopper door. 261. Front hopper casting for ashpan. 262. Connecting link rear ashpan hopper door rigging. 263. Rear hopp ashpan door. 264. Lifting bar rear ashpan hopper door. 265. Swinging lever rear hopper ashpan door. 266. Trailing truck and driving equalizer. 267. Rear fram section bolts. 268. Equalizer fulcrum ball. 269. Equalizer fulcrum socket bracket. 270–277. Trailing truck details. 278–279. Trailing truck brakeshoe and brak head. 280–281. Trailing truck brake cylinder and air pipe. 282. Rear section of engine frame. 283. Footplate. 284. Drawbar pin. 285–287. Keeper key, keeper a drawbar. 288. Unit safety bar. 299. Bell lever and bell cord. 315. Sand box rod. 390. Ragonnet reverse gear reach rod. 396–397. Tate flexible stay bolt c and sleeve. 398. Tate flexible stay bolt. 399–400. Sellers fountain valve and fountain. 401. Injector steam pipe. 402–403. Sellers U.S. standard non-liftin injector details. 404–405. Steam turret and valve. 406. Sellers U.S. standard non-lifting injector hand pull. 407. Boiler bracket for injector hand pull. 40 Sellers U.S. standard non-lifting injector hand pull handle. 409. Sellers injector indicator. 410. Sellers U.S. standard non-lifting injector. 411. Sellers U. standard non-lifting injector overflow. 412. Sellers U.S. standard non-lifting injector line check. 413. Sellers feed water strainer. 414. Hose nut thread for fe water suction pipe. 415. Rear Anchor for back head brace. 416. Pyle National head-light turbine. 417. Steam gauge. 420. Security sectional brick arch. 42 Arch tube. 422. Copper pipe for injector indicator. 423. Grate trunnion bearing. 424. Grade side frame. 425–427. Front gate shaking bar, arm and connectio 428–429. Dumping grate crank arm and connecting bar. 430. Dumping grate lever. 431. Dumping grate. 432–433. Grate finger and grate trunnion. 434–43 Grate arm and grate trunnion boss. 436. Back grate shaking bar. 437. Grate shaking rod. 440. Ashpan frame. 441. Foundation ring. 442–447. Sellers U. standard non-lifting injector details. 448–454. Ragonnet power reverse gear details. 455. Door opening. 456. Back boiler head. 457. Stiffening plate for boil brace. 458. Cab ventilator. 459. Whistle bell crank. 460. Cab roof. 461. Cab eaves trough. 462. Throttle fulcrum. 463. Throttle stem stuffing box gland. 46 Throttle stem. 465. Throttle lever. 466–467. Throttle lever quadrant and latch handle. 468. Throttle stem stuffing box. 469. Steam gauge siphon coil. 47 Westinghouse independent brake valve handle. 471. Westinghouse independent brake valve body. 472. Westinghouse engineer's valve handle. 473. Westi house engineer's valve top case. 474. Brake pipe. 475. Duplex stoker elevator casing. 476. Franklin butterfly fire door. 477. Franklin fire door latch brack 478. Duplex stoker steam jet nozzle. 479–480. Franklin fire door opener gear casing and cylinder. 481. Franklin fire door opener hand lever. 482. Dup stoker elevator drive and reverse casing. 483. Duplex stoker operating handle. 484. Franklin fire door opener hanger bolt. 485. Franklin fire door opener tr hanger adjusting gear. 486–487. Franklin fire door opener tread and hanger. 488. Duplex stoker conveyor drive and reverse gear. 489. Duplex stoker ste valve rod to engine. 490–491. Duplex stoker engine cylinder head and frame. 492. Duplex stoker supporting leg or cradle casting. 493. Duplex stoker r housing. 494. Duplex stoker lubricator hole in rack housing. 495. Duplex stoker conveyor drive and reverse unit. 496–500. Cab window, sash, frame guides. 501–502. Cab seat and box. 503. Sand rod handle. 504. Steam pipe to injector. 505. Side sheet of fire box. 508–509. Top and bottom trailing t spring hanger keys. 522. Drawbar pin bushing. 525. Inside throat sheet. 526. Whistle lever rod. 528–529. Duplex stoker elevator shifter and shaft. Franklin fire door opener tread weight. 531. Duplex stoker distributor tube. 532. Duplex stoker deflecting ribs of distributor tube. 533. Cab handhold or g iron. 641–642. Cab hood. 643. Double-heading cock



COURTESY OF THE ANGUS SINCLAIR COMPANY

PACIFIC OR 4-6-2 TYPE LOCOMOTIVE—BOILER AND DRIVE WHEEL DETAILS

. Running board. 160. Baker valve gear reverse yoke pivot pin. 161. Baker valve gear (*see* Plate IX.). 162. Driver spring stirrup. 171–172. Driver brake rod and hangar. 174. Driving wheel spoke. 175. Driving wheel tyre. 176. Baker valve gear eccentric rod. 177. Front driving axle journal bearing. 178. nt driving axle. 181. Connecting or main rod. 182. Front section of side or parallel rod. 184. Baker valve gear reverse yoke. 185. Reach rod carrying arm. . Valve gear counterbalance spring case. 187. Baker gear frame bracket. 188. Frame brace. 189. Driver spring hanger. 190. Driver brake lever. 191. Main er spring. 192. Driver spring hanger step. 193. Main driver counterbalance. 194. Driving wheel and axle key. 195. Main driving axle. 196. Main driving el hub. 197. Baker valve gear eccentric crank. 198. Main crank pin. 199. Reach rod. 200. Main driver spring hanger seat. 201. Frame brace. 202. Top of main frame. 203. Equalizer bracket. 204. Driver equalizer. 205. Lower rail of main frame. 206. Rear section of side of parallel rod. 207. Knuckle pin ide rod. 208. Connecting rod fork. 209. Connecting rod cotter for brasses. 210. Connecting rod key for brasses. 211. Connecting rod oil cup. 212. Eccen- crank clamp. 213. Eccentric rod crank pin. 214–231. Ragonnet power reverse gear details. 232. Rear driving axle spring. 233–234. Driving axle spring l and stirrup. 235. Franklin automatic driving box. 236. Franklin automatic driving box adjusting wedge. 237. Rear driving axle journal bearing. 238. driving axle journal box. 239. Rear side rod flange. 240–242. Franklin automatic adjustable driving box wedge spring bracket, bolt and spring. 243. driving wheel crank pin. 244. Franklin automatic adjustable driving box wedge spring cap. 245. Rear driving axle. 246–247. Driver brake beam, eshoe and lever. 249–250. Foundation ring bearing shoe and support. 251. (*see* Plate VII.) 300. Dry pipe—runs from steam to cylinders (*see* e IX.) 306. Sand box cap. 308. Sellers injector check. 309. Delivery pipe. 310. Superheater unit support. 311–312. Sand pipe and sand box. 313– Sand lever and sand pipe connection. 315. Sand box rod. 316. Westinghouse air pump low pressure air cylinder lubricator. 317. Westinghouse air pump pressure air cylinder lubricator. 318–350. Westinghouse air pump details. 352. Second course of boiler shell. 353. Dome reinforcing plate. 354. Dome. Front anchor for back head brace. 356. Hand rail. 357. Dome casing. 358–365. Chamber throttle valve. 366. Air pipe from duplex compressor governor ain reservoir. 367. Steam pipe from duplex compressor governor to compressor. 368. Steam valve body of duplex compressor governor. 369. Steam pipe compressor. 370. Chamber throttle valve throttle rod. 371–373. Whistle, whistle rod and whistle lever. 374. Check unit from maximum compressor head plex compressor governor. 375. Check unit for excess pressure head of duplex compressor governor. 376. Spring box for maximum pressure head of duplex pressor governor. 377. Diaphragm body for duplex compressor governor. 378. Siamese fitting for duplex compressor governor. 379. Pipe from excess pressure of duplex compressor governor to automatic brake valve. 380. Safety valve. 382–384. Chambers throttle valve balance valve, piston and packing ring. Superheater forged return bend. 386. Ragonnet reverse gear valve chest gland. 387. Beading on tubes. 388. Arch tube wash-out plug. 389. Outside et sheet. 391. Back tube sheet. 392. Crown sheet. 393. Stiffening plate for safety valve opening. 394. Outside roof sheet of fire box. 395. Boiler e. 418. Combustion chamber. 419. Wash-out plug. 506. Side rod oil cup. 516. Front driving wheel crank. 517. Front driving wheel counter balance. Baker valve gear counter balance rod and arm. 520. Main reservoir. 521. Driver spring hanger key. 523. Westinghouse compound air pump. 524. house air pump high pressure air piston. 527. Belpaire cross stay

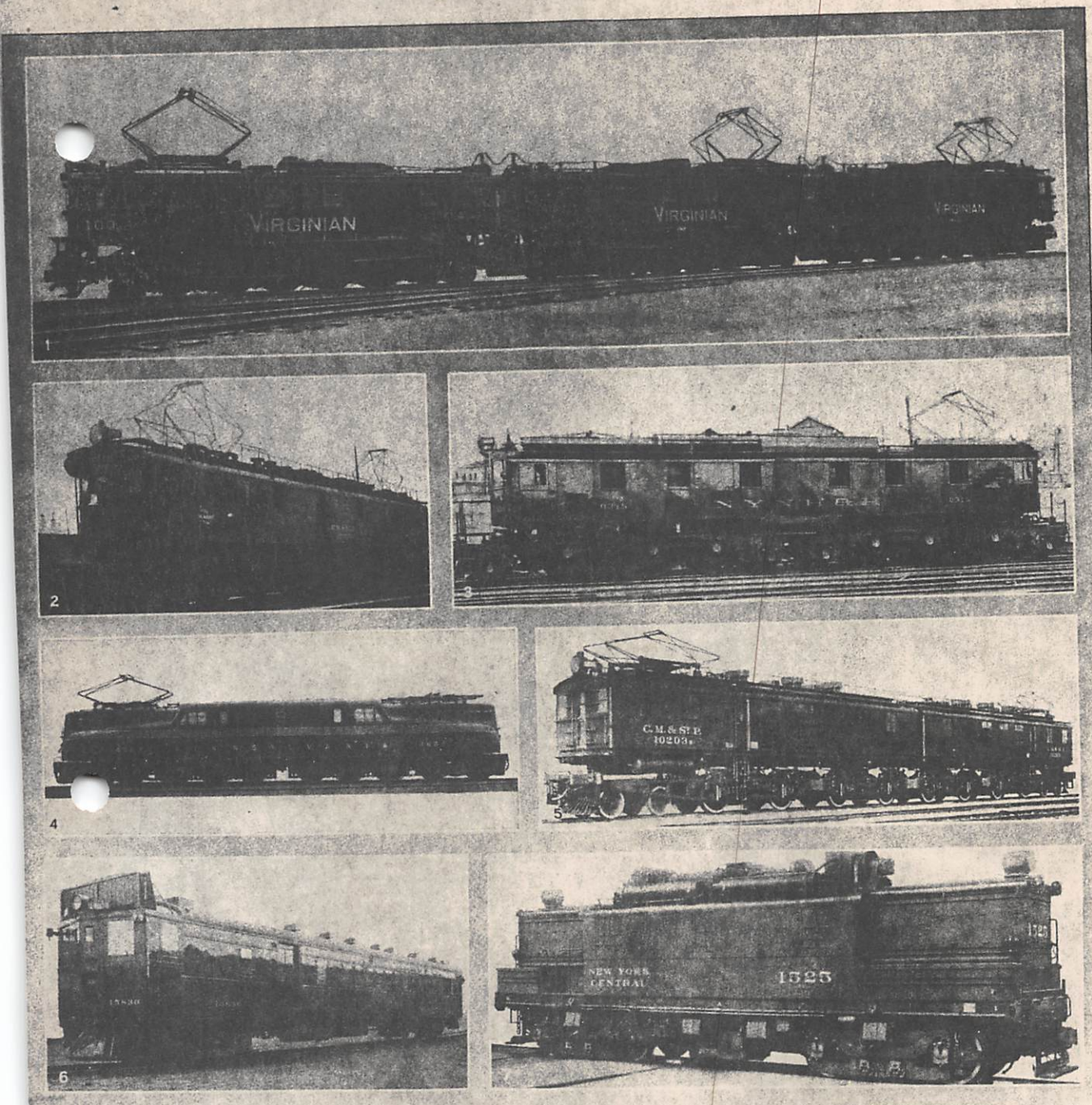


COURTESY OF THE ANGUS SINCLAIR COMPANY

PACIFIC OR 4–6–2 TYPE LOCOMOTIVE—CYLINDER AND SMOKEBOX DETAILS

9. Coupler and uncoupling lever details. 9. Front end step. 10–12. Pilot nosing, base and bar. 13. Coupler knuckle pin. 14. Pilot brace. 15. Safety chain e
. Snow flanger equalizer (Ray type). 17. Pilot and buffer angle. 18. Back vertical of pilot. 19–20. Pilot step bracket trend. 21. Pilot base tie bolt. 22–2
ow flanger details (Ray type). 25. Truck pedestal. 26. Truck wheel. 27. Truck axle box cellar. 28. Truck axle. 29. Truck axle journal bearing. 30. Tru
rnal box. 31. Truck pedestal rib. 32. Truck frame. 33–34. Extension piston rod casing and rod. 35. Pedestal tiebar bolt. 36. Truck pedestal bolt.
uck pedestal tiebar cross tie. 38. Truck brakeshoe. 39. Truck brakehead. 40. Truck brake lever. 41. Front truck equalizer. 42. Cylinder cock slide r
–44. Truck spring hanger and bracket. 45. Cylinder shell. 46. Cylinder bushing. 47. Front cylinder head. 48–49. Front cylinder head casing and flan
. Extension piston rod packing. 51–52. Front truck semi-elliptic spring and band. 53–54. Piston rod and piston. 55. Steam port. 56. Piston packing ri
–58. Front plate stiffening angle and front plate. 59. Front buffer beam. 60–63. Lubricator details (Schlacks system). 64. Front steam chest casing.
iler front bolt. 66. Boiler front. 67. Boiler front hand rail. 68–69. Smoke-box door clamp and door. 70–72. Flagstaff fixture, flagstaff and signal flag.
. Spark cleaning hole cap ring, cap and handle. 76. Smoke-box door clamp bolt. 77. Cylinder. 78. Piston nut. 79. Truck pedestal tiebar. 80–81. Numb
te stud and number plate. 82–85. Head-light bracket, lamp, reflector and casing (Pyle National). 86. Front smoke-box ring. 87. Netting frame. 88. Smo
k shell. 89. Smokestack. 90–91. Steam-pipe ring and flange. 92. Superheater steam-pipe connection. 93. Saturated steam passage. 94. Superheater ste
ssage. 95. Superheater header (type A). 96. Superheater unit ball end. 97. Superheater unit clamp. 98. Dry pipe flange. 99. Superheater header ring.
y pipe stiffening ring. 101. Front tube sheet. 102. Smokestack lift pipe. 103–104. Netting stud and netting. 105. Diaphragm. 106–113. Superhe
mper details. 114. Steam pipe. 115. Muffled exhaust nozzle. 116–117. Exhaust pipe and passage. 118. Horizontal diaphragm pocket. 119. Lubricator
ragm terminal check valve (Schlacks system). 120. Lubricator terminal check valve steam pipe extension (Schlacks system). 121. Intermediate smoke
g. 122–123. Steam chest casting and bushing. 124–125. Piston valve packing and bull ring. 126. Steam chest. 127–128. Piston valve and valve stem.
ck cylinder head. 130. Piston rod packing (Q. and C. type). 131. Piston rod lubricator (Q. and C. type). 132. Front steam chest head. 133. Superh
it pipe. 134. Lubricator lever link (Schlacks system). 135. Valve stem lubricator. 136. Cylinder cock reach rod. 137. Valve stem cross head guide.
ck steam chest head. 139. Back steam chest head stud. 140. Driving brake cylinder. 141. Baker valve gear combination lever. 143–144. Top and bo
ides. 145. Cylinder cock shaft. 146. Driver and truck equalizer. 147. Cylinder cock. 148. Cylinder cock shaft arm. 149. Truck wheel web. 150. B
te. 151. Baker gear valve rod. 152. Cross head. 153. Baker valve gear union rod. 154. Wrist or cross-head pin. 155–157. Baker valve gear frame, cro
d bell crank. 158. Front driver spring. 159. Baker valve gear radius bar. 163. Guide yoke. 164. Front driving spring hanger. 165. Guide strap. 166. E
me. 167. Front pedestal leg. 168. Pedestal tie. 169. Brake pull rod adjusting nut. 170. Truck wheel flange. 173. Driver tire retaining ring. 180.
ke. 183. Brake pull rod turn buckle. 289. Smokestack base reinforcing plate. 290–291. Boiler lagging and boiler jacket. 292. Hammett bell-ringer
3. Bell. 294–295. Hammett bell-ringer piston rod and bell-ringer cylinder. 296–297. Bell stand and bell yoke. 298–299. Bell lever and bell cord. 30
e. 301. Handrail bracket. 302. Superheater tube. 303. Superheater unit band. 304. Boiler tube or flue. 305. Boiler belly brace. 307. Sellers injecto
ve. 351. Front course of boiler shell. 381. Snow flanger cross tie brace (Ray type). 438–439. Driving brake cylinder head and piston rod. 507.
9. Pyle National head-light side-light bulb. 511. Smokebox. 512. Superheater damper counter weight arm. 513. Truck wheel rim. 514. Truck whe
5. Pedestal tie bolts

LOCOMOTIVE



BY COURTESY OF (1-3) THE WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, (4) THE PENNSYLVANIA RAILROAD, (5) THE GENERAL ELECTRIC COMPANY, (6) THE CANADIAN NATIONAL RAILWAYS, (7) THE ELECTRIC STORAGE BATTERY COMPANY

ELECTRIC PASSENGER AND FREIGHT LOCOMOTIVES IN USE ON AMERICAN RAILROADS

1. Virginian Railway. Three 2-8-2 units, AAR Classification 3 (1-D-1), built by American Loco. Co., & Westinghouse Elec. and Mfg. Co.; 11,000 or 22,000 volts A.C. Total wt. 1,282,380 lb.; wt. on drivers 922,580 lb.; wt. on guiding trucks 359,800 lb.; capacity at one hr. rating 6,090 h.p. at 14.1 m.p.h.; 7,125 h.p. at 28.3 m.p.h. Starting tractive effort 277,500 lb. at 30.07% adhesion; tractive effort, hourly rating, 162,000 lb. at 14.1 m.p.h., 94,500 lb. at 28.3 m.p.h.; tractive effort continuous rating, 135,000 lb. at 14.2 m.p.h.

2. Chicago, Milwaukee, St. Paul & Pacific Railroad. One 4-6-2 and one 2-6-4 articulated units, built by Westinghouse Elec. & Mfg. Co.; 300 tons cap.; 3,000 volts D.C. Total wt. of locomotive 600,000 lb.; wt. on drivers 378,000 lb.; wt. on idle trucks 222,000 lb.; capacity at one hr. rating 4,680 h.p. Starting tractive effort 94,500 lb.; tractive effort, hourly rating, 66,000 lb.; tractive effort, continuous rating, 40,800 lb.

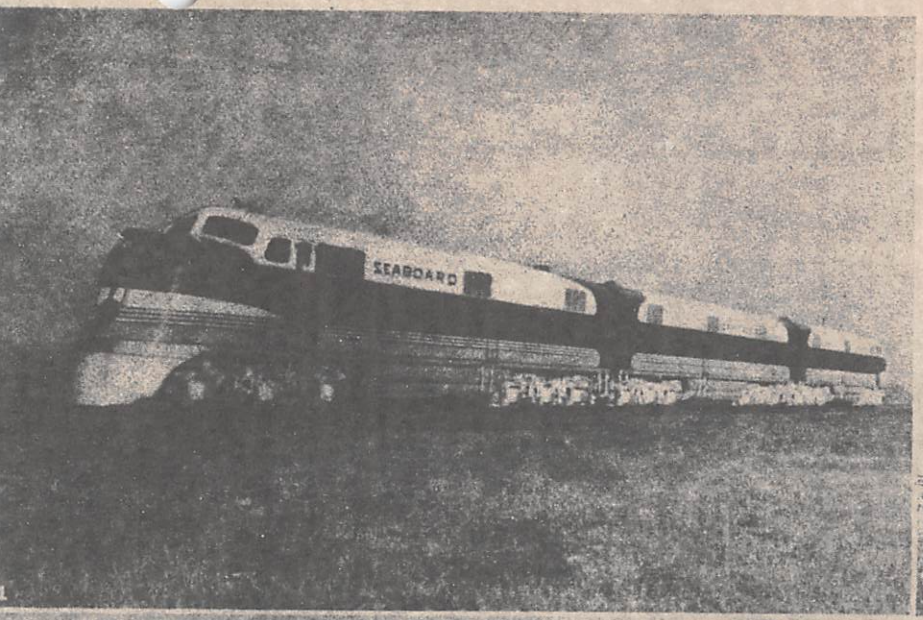
3. *New York, New Haven & Hartford* Railroad. Two 2-6-2 articulated units, built by Westinghouse Elec. & Mfg. Co.; *11,000 volts A.C.* Total wt. of locomotive 356,000 lb., wt. on drivers 240,000 lb., wt. on idle trucks 116,000 lb.; capacity at one hr. rating 2,508 h.p. Starting tractive effort 52,500 lb.; tractive effort, hourly rating, 19,260 lb., continuous rating, 13,080 lb.

4. Pennsylvania Railroad. One articulated unit (4-6-0 + 0-6-4). Class GG1. Built by the Pennsylvania Railroad. 11,000 volt A.C. Total weight of locomotive 460,000 lb.; weight on drivers 300,000 lb., weight on idle trucks 160,000 lb.; capacity at continuous rating 4,620 h.p. Starting tractive effort 72,800 lb.; tractive effort, continuous rating (90 miles per hour) 19,140 lb.

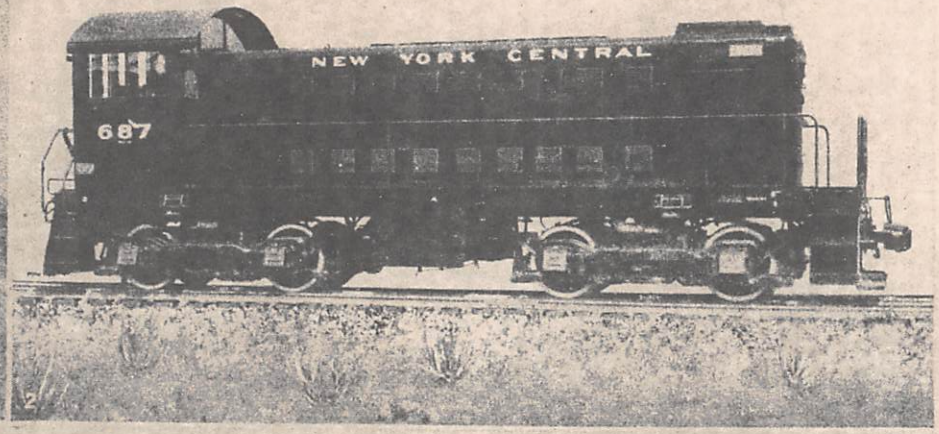
5. Chicago, Milwaukee, St. Paul & Pacific Railroad. Two 4-8-0 articulated units, built by General Elec. Co.; 3,000 volt D.C. Total wt. of locomotive 564,000 lb.; wt. on drivers 448,000 lb.; wt. on idle trucks 116,000 lb. Starting tractive effort 112,000 lb.; tractive effort, hourly rating, 71,000 lb.

6. Canadian National Railways. Two 4-wheel-truck type oil-electric passenger and baggage motor car, built at Point Charles Works, Montreal. Length of car body 73 ft. 9 in. over end sills; total wt. on rails 133,000 lb. Beardmore six-cylinder oil engine, 300 h.p. at 750 r.p.m. Westinghouse 198 K.W. D.C. generator, two 600 volt 200 h.p. motors.

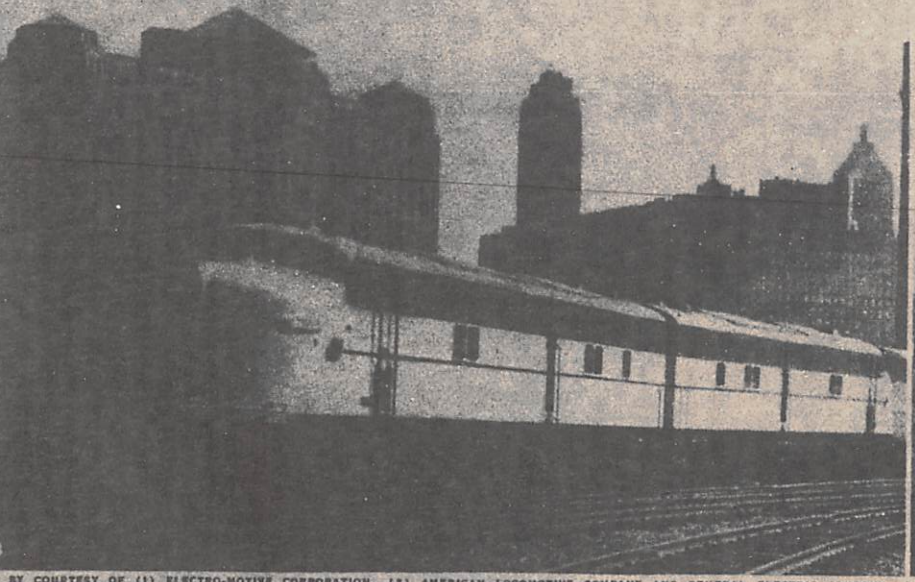
7. New York Central Railroad. Two 4-wheel-truck type, built by Elec. Storage Battery Co. Combination battery and oil-electric; 218-cell storage battery, capacity 294 [illegible]. Four motors, total rated 1,500 h.p.; motor gear ratio 4.2 [illegible]; driving wheels 44 in. diam. Tractive effort, max. 60,000 lb. Total wt. on drivers 257,000 lb.; 300 h.p.



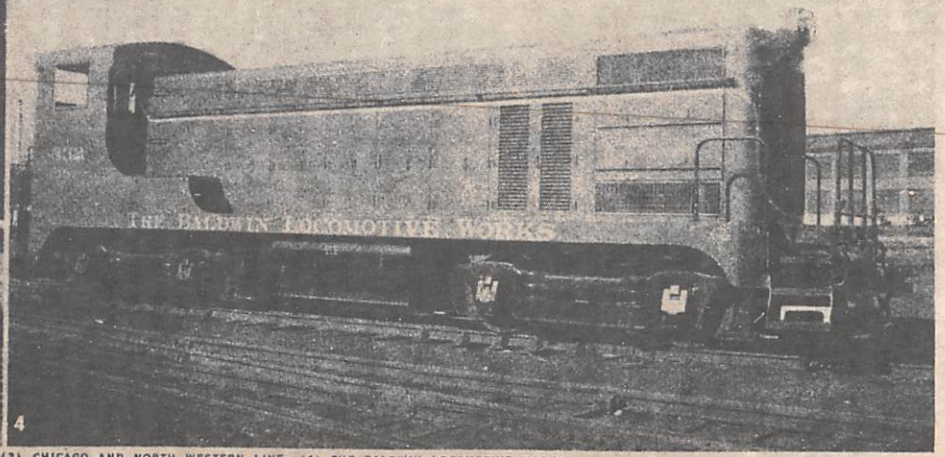
1



2



3

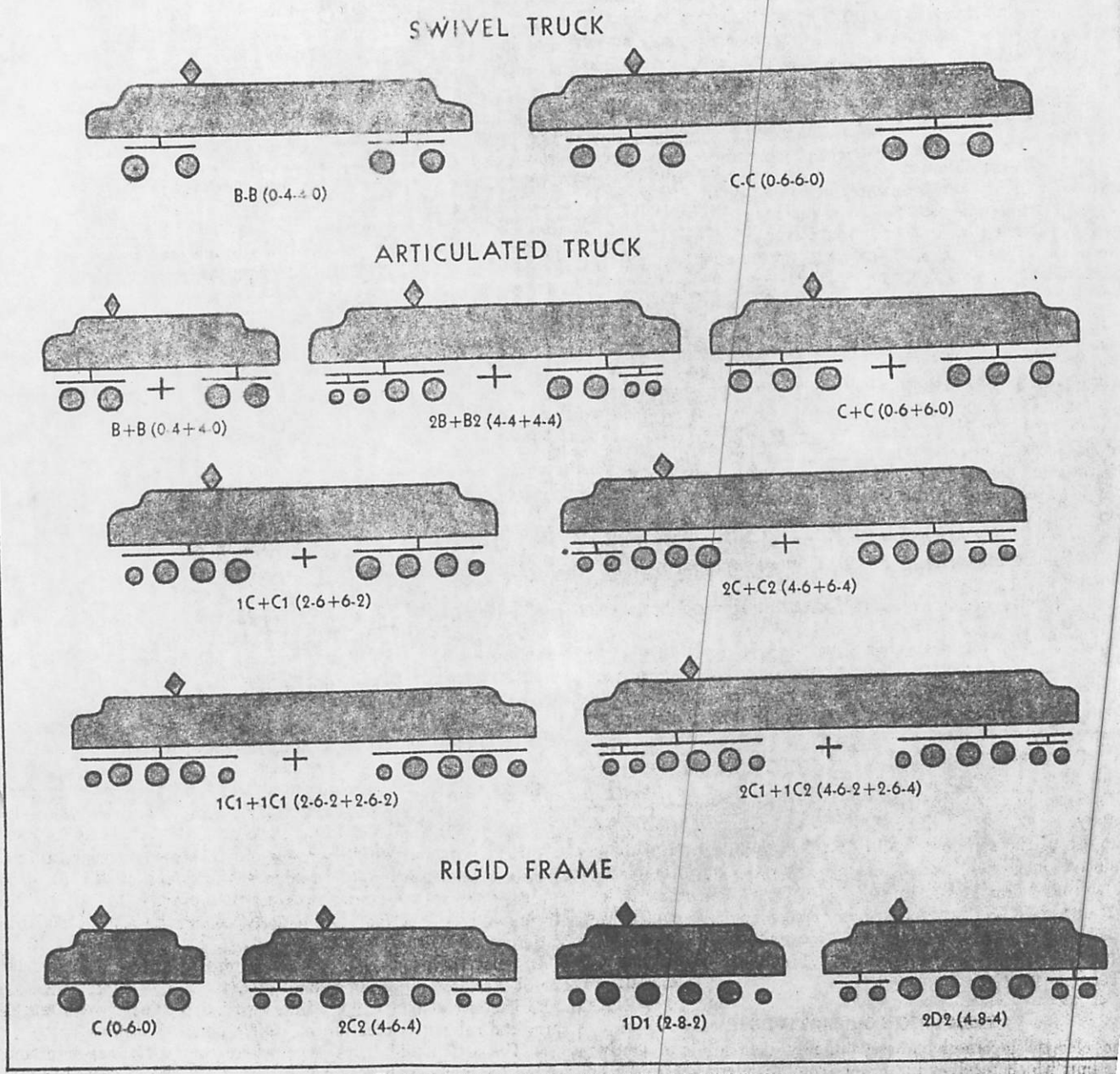


4

BY COURTESY OF (1) ELECTRO-MOTIVE CORPORATION, (2) AMERICAN LOCOMOTIVE COMPANY AND GENERAL ELECTRIC COMPANY, (3) CHICAGO AND NORTH WESTERN LINE, (4) THE BALDWIN LOCOMOTIVE WORKS

OIL-ELECTRIC LOCOMOTIVES FOR PASSENGER AND FREIGHT SERVICE

1. Three-unit diesel-electric locomotive for passenger train service. This streamlined locomotive develops a total of 6,000 horse-power
2. Alco G.E. diesel-electric 660-h.p. switching locomotive
3. Diesel-electric locomotive of two units that draws a streamlined passenger train, "The 400," between Chicago and Minneapolis
4. Diesel-electric switching locomotive 1,000 h.p.; [illegible]



TYPES OF ELECTRIC LOCOMOTIVE MECHANICAL DESIGN

to meet normal curve restrictions with more than four driving axles in the rigid wheel base. Thus, where large capacities are required, this type is restricted to those railroads which will permit relatively heavy axle loadings.

The articulated type has the widest possible field of application. Since it is practical to provide six to eight driving axles, this type offers the designer a wide variety of choices to meet any particular requirements.

The design of the guiding trucks is influenced largely by the prevailing speeds at which the locomotive will be called upon to operate. Single axle trucks are generally preferred for medium speeds, but above 60 m.p.h., two-axle trucks predominate. To perform effectively their function in guiding, the weight carried by each guiding axle must be from 50% to 80% of the weight carried by each driving axle. The design of the guiding trucks is a most important feature for very high speed operation. By proper design of its mechanical parts, the electric locomotive can be made safe for operation at any speeds permitted by the roadbed.

Drive.—One feature of the electric locomotive which has received much attention is the "drive," or the arrangement by which the motor torque is transmitted to the driving wheels. All locomotive drives may be classified into two general types: (*a*) th dividual axle drive where each axle is driven by its own mot motors, and (*b*) the collective drive where two or more axl driven from one motor or group of motors. While the coll drive is somewhat the outgrowth of steam practice, both have been widely used, although more recently, especia America, the individual axle drive has greatly predominate eliminates side rods and heavy rotating parts.

The simplest form of individual axle drive is the direct axle hung motor. Here the motor is mounted within the tr geared directly to the axle to be driven. The motor is su on one side by bearings on the axle, and on the opposite a nose support which rests on some portion of the tru field of application of this drive is somewhat restricted limitations, but for those cases where it is suitable it used because of low cost and low maintenance expense.

When the service to the which the locomotive is to be ap for large capacity motors operating at high speeds, exp proven the desirability of carrying the motors on borne parts of the running gear to relieve the track unsprung weight. When this mounting is used, the

(J. A. Th.)

LOCOMOTIVE. This article deals with the three types of locomotives used in railway transportation: (1) self-contained and self-propelled high pressure steam, (2) internal combustion and (3) electric locomotives dependent upon an outside source of power. *See also* BOILERS; STEAM GENERATION; RAILWAYS; TRACTION, ELECTRIC and various other articles under specific headings.

Encyclopedia Britanica
p. 278